CLAIMS

1. A zoom lens comprising, in order from an object side to an image side, a first lens unit of negative refractive power, a second lens unit of positive refractive power, a third lens unit of negative refractive power, and a fourth lens unit of positive refractive power, wherein said first lens unit has a negative lens located on the most object side thereof, and said negative lens located on the most object side of said first lens unit satisfies the following conditions:

(a) $35 < \nu 11n < 65$, and

(b) when $35 < \nu 11n < 52$,

$-0.013\ \nu 11n + 2.19 < N11n < -0.005\ \nu 11n + 1.92$,

when $52 < \nu 11n < 60$,

$1.5 < N11n < -0.005\ \nu 11n + 1.92$,

when $60 < \nu 11n < 65$,

$1.5 < N11n < -0.022\ \nu 11n + 2.94$,

where $\nu 11n$ is an Abbe number of a material of said negative lens located on the most object side of said first lens unit, and N11n is a refractive index of the material of said negative lens located on the most object side of said first lens unit.

2. A zoom lens according to claim 1, wherein said first lens unit has a second negative lens other than said negative lens located on the most object side thereof, and said second negative lens satisfies the

following conditions:

(c) $35 < \nu 12n < 65$, and

(d) when $35 < \nu 12n < 52$,

$-0.013\ \nu 12n + 2.19 < N12n < -0.005\ \nu 12n + 1.92$,

when $52 < \nu 12n < 60$,

$1.5 < N12n < -0.005\ \nu 12n + 1.92$,

when $60 < \nu 12n < 65$,

$1.5 < N12n < -0.022\ \nu 12n + 2.94$,

where $\nu 12n$ is an Abbe number of a material of said second negative lens of said first lens unit, and N12n is a refractive index of the material of said second negative lens of said first lens unit.

3. A zoom lens according to claim 1, wherein said zoom lens becomes, at a telephoto end, a telephoto type in which a plurality of lens units are divided into a lens group on the object side composed of at least one lens unit having a positive refractive power and a lens group on the image side composed of at least one lens unit having a negative refractive power.

4. A zoom lens according to claim 1, wherein, during variation of magnification from a wide-angle end to a telephoto end, said first lens unit moves with a locus convex toward the image side, said second lens unit moves toward the object side in such a way as to decrease a separation between said first lens unit and said second lens unit, said third lens unit moves toward the object

side in such a way as to increase a separation between said second lens unit and said third lens unit, and said fourth lens unit moves toward the object side in such a way as to decrease a separation between said third lens unit and said fourth lens unit.

5. A zoom lens according to claim 1, wherein said zoom lens satisfies the following condition:

$$0.9 < |f1/fw| < 1.8$$

where f1 is a focal length of said first lens unit, and fw is a focal length of said zoom lens in a wide-angle end.

6. A zoom lens according to claim 1, wherein said first lens unit comprises, in order from the object side to the image side, a negative lens of meniscus form having a convex surface facing the object side, a negative lens, and a positive lens of meniscus form having a convex surface facing the object side.

7. A zoom lens according to claim 1, wherein said second lens unit and said fourth lens unit move in unison with each other during variation of magnification.

8. A zoom lens according to claim 1, wherein said zoom lens satisfies the following conditions:

$$0.65 < f2/fw < 1.3$$

$$1.2 < |f3/fw| < 3.4$$

where f2 and f3 are focal lengths of said second lens unit and said third lens unit, respectively, and fw is a focal length of said zoom lens in a wide-angle end.

9. A zoom lens according to claim 1, wherein said zoom lens consists of said first to fourth lens units, and satisfies the following condition:

$$2.1 < f4/fw < 8.5$$

where f4 is a focal length of said fourth lens unit, and fw is a focal length of said zoom lens in a wide-angle end.

10. A zoom lens according to claim 1, wherein said second lens unit comprises two positive lenses and one negative lens.

11. A zoom lens according to claim 1, wherein said third lens unit comprises a cemented lens composed of a negative lens and a positive lens.

12. A zoom lens according to claim 1, wherein said fourth lens unit comprises a negative lens and a positive lens, and has at least one aspheric surface.

13. A zoom lens according to claim 1, wherein said second lens unit comprises one positive lens and a positive cemented lens composed of a negative lens and a positive lens.

14. A zoom lens according to claim 1, wherein said fourth lens unit has a plastic aspheric lens.

15. A zoom lens according to claim 1, wherein said second lens unit comprises one positive lens and a positive cemented lens composed of a negative lens and a positive lens, said third lens unit comprises a negative lens and a positive lens, and said fourth lens unit comprises a negative lens and a positive lens, and has a plastic aspheric lens.

16. An image pickup apparatus comprising a zoom lens according to claim 1, a photosensitive member, and means for supporting said zoom lens and said photosensitive member.

17. An image projection apparatus comprising a zoom lens according to claim 1, a light source, and an image forming element, and arranged to project an image.

18. A zoom lens comprising, in order from an object side to an image side, a first lens unit of negative refractive power, a second lens unit of positive refractive power, and a third lens unit, wherein all said first to third lens units move during variation of magnification, said first lens unit has a negative lens located on the most object side thereof, and said negative lens located on the most object side of said

first lens unit satisfies the following conditions:

(a) $35 < \nu 11n < 65$, and

(b) when $35 < \nu 11n < 52$,

$-0.013\ \nu 11n + 2.19 < N11n < -0.005\ \nu 11n + 1.92$,

when $52 < \nu 11n < 60$,

$1.5 < N11n < -0.005\ \nu 11n + 1.92$,

when $60 < \nu 11n < 65$,

$1.5 < N11n < -0.022\ \nu 11n + 2.94$,

where $\nu 11n$ is an Abbe number of a material of said negative lens located on the most object side of said first lens unit, and N11n is a refractive index of the material of said negative lens located on the most object side of said first lens unit.

19. A zoom lens according to claim 18, wherein said first lens unit has a second negative lens other than said negative lens located on the most object side thereof, and said second negative lens satisfies the following conditions:

(c) $35 < \nu 12n < 65$, and

(d) when $35 < \nu 12n < 52$,

$-0.013\ \nu 12n + 2.19 < N12n < -0.005\ \nu 12n + 1.92$,

when $52 < \nu 12n < 60$,

$1.5 < N12n < -0.005\ \nu 12n + 1.92$,

when $60 < \nu 12n < 65$,

$1.5 < N12n < -0.022\ \nu 12n + 2.94$,

where $\nu 12n$ is an Abbe number of a material of said second negative lens of said first lens unit, and N12n is a

refractive index of the material of said second negative lens of said first lens unit.

20. A zoom lens according to claim 18, wherein said third lens unit has a negative refractive power.

21. A zoom lens according to claim 18, wherein said zoom lens becomes, at a telephoto end, a telephoto type in which a plurality of lens units are divided into a lens group on the object side composed of at least one lens unit having a positive refractive power and a lens group on the image side composed of at least one lens unit having a negative refractive power.

22. A zoom lens according to claim 18, wherein said zoom lens satisfies the following condition:

$$0.9 < |f1/fw| < 1.8$$

where f1 is a focal length of said first lens unit, and fw is a focal length of said zoom lens in a wide-angle end.

23. A zoom lens according to claim 18, wherein said first lens unit comprises, in order from the object side to the image side, a negative lens of meniscus form having a convex surface facing the object side, a negative lens, and a positive lens of meniscus form having a convex surface facing the object side.

24. A zoom lens according to claim 18, wherein said second lens unit comprises two positive lenses and one negative lens.

25. A zoom lens according to claim 18, wherein said third lens unit comprises a cemented lens composed of a negative lens and a positive lens.

26. A zoom lens according to claim 18, wherein said second lens unit comprises one positive lens and a positive cemented lens composed of a negative lens and a positive lens.

27. An image pickup apparatus comprising a zoom lens according to claim 18, a photosensitive member, and means for supporting said zoom lens and said photosensitive member.

28. An image projection apparatus comprising a zoom lens according to claim 18, a light source, and an image forming element, and arranged to project an image.

29. A zoom lens comprising, in order from an object side to an image side, a first lens unit of negative refractive power and a second lens unit of positive refractive power, said second lens unit of positive refractive power consisting of two positive lenses and one negative lens, wherein the following conditions are

satisfied:

$$1.1 < |f1/fw| < 1.4$$

$$0.8 < |f2/fw| < 1.1$$

where f1 and f2 are focal lengths of said first lens unit and said second lens unit, respectively, and fw is a focal length of said zoom lens in a wide-angle end.

30. A zoom lens according to claim 29, wherein said zoom lens becomes, at a telephoto end, a telephoto type in which a plurality of lens units are divided into a lens group on the object side composed of at least one lens unit having a positive refractive power and a lens group on the image side composed of at least one lens unit having a negative refractive power.

31. A zoom lens according to claim 29, wherein said first lens unit comprises, in order from the object side to the image side, a negative lens of meniscus form having a convex surface facing the object side, a negative lens, and a positive lens of meniscus form having a convex surface facing the object side.

32. A zoom lens according to claim 29, wherein one of said two positive lenses and said one negative lens in said second lens unit are cemented together to form a cemented lens, and the following condition is satisfied:

$$20 < \nu 2p - \nu 2n$$

where $\nu 2p$ is an Abbe number of a material of said

positive lens of said cemented lens of said second lens unit, and $\nu 2n$ is an Abbe number of a material of said negative lens of said cemented lens of said second lens unit.

33. An image pickup apparatus comprising a zoom lens according to claim 29, a photosensitive member, and means for supporting said zoom lens and said photosensitive member.

34. An image projection apparatus comprising a zoom lens according to claim 29, a light source, and an image forming element, and arranged to project an image.

35. A zoom lens comprising, in order from an object side to an image side, a first lens unit of negative refractive power, a second lens unit of positive refractive power, and a third lens unit of negative refractive power, wherein the following conditions are satisfied:

$$1.1 < |f1/fw| < 1.4$$

$$0.8 < |f2/fw| < 1.1$$

where f1 and f2 are focal lengths of said first lens unit and said second lens unit, respectively, and fw is a focal length of said zoom lens in a wide-angle end.

36. A zoom lens according to claim 35, wherein said zoom lens becomes, at a telephoto end, a telephoto type

in which a plurality of lens units are divided into a lens group on the object side composed of at least one lens unit having a positive refractive power and a lens group on the image side composed of at least one lens unit having a negative refractive power.

37. A zoom lens according to claim 35, wherein said first lens unit comprises, in order from the object side to the image side, a negative lens of meniscus form having a convex surface facing the object side, a negative lens, and a positive lens of meniscus form having a convex surface facing the object side.

38. A zoom lens according to claim 35, wherein a stop is disposed adjacent to said third lens unit, said stop moving in unison with said third lens unit.

39. A zoom lens according to claim 38, wherein said stop is disposed on the object side of said third lens unit.

40. A zoom lens according to claim 35, wherein said third lens unit comprises one positive lens and one negative lens, and the following condition is further satisfied:

$$1.5 < |f3/fw| < 3.0$$

where f3 is a focal length of said third lens unit.

41. A zoom lens according to claim 35, wherein said second lens unit has a cemented lens composed of a negative lens and a positive lens, and the following condition is further satisfied:

$$20 < \nu 2p - \nu 2n$$

where $\nu 2p$ is an Abbe number of a material of said positive lens of said cemented lens of said second lens unit, and $\nu 2n$ is an Abbe number of a material of said negative lens of said cemented lens of said second lens unit.

42. A zoom lens according to claim 35, wherein said third lens unit has a cemented lens composed of a negative lens and a positive lens, and the following conditions are further satisfied:

$$4.0 < \nu 3n - \nu 3p < 12.0$$

$$0.05 < N3p - N3n < 0.20$$

where $\nu 3n$ is an Abbe number of a material of said negative lens of said cemented lens of said third lens unit, $\nu 3p$ is an Abbe number of a material of said positive lens of said cemented lens of said third lens unit, N3p is a refractive index of the material of said positive lens of said cemented lens of said third lens unit, and N3n is a refractive index of the material of said negative lens of said cemented lens of said third lens unit.

43. An image pickup apparatus comprising a zoom

lens according to claim 35, a photosensitive member, and means for supporting said zoom lens and said photosensitive member.

44. An image projection apparatus comprising a zoom lens according to claim 35, a light source, and an image forming element, and arranged to project an image.

45. A zoom lens comprising, in order from an object side to an image side, a first lens unit of negative refractive power, a second lens unit of positive refractive power, a third lens unit of negative refractive power, and a fourth lens unit of positive refractive power, wherein the following conditions are satisfied:

$$1.1 < |f1/fw| < 1.4$$

$$0.8 < |f2/fw| < 1.1$$

where f1 and f2 are focal lengths of said first lens unit and said second lens unit, respectively, and fw is a focal length of said zoom lens in a wide-angle end.

46. A zoom lens according to claim 45, wherein said zoom lens becomes, at a telephoto end, a telephoto type in which a plurality of lens units are divided into a lens group on the object side composed of at least one lens unit having a positive refractive power and a lens group on the image side composed of at least one lens unit having a negative refractive power.

47. A zoom lens according to claim 45, wherein, during variation of magnification from a wide-angle end to a telephoto end, said first lens unit moves with a locus convex toward the image side, said second lens unit moves toward the object side in such a way as to decrease a separation between said first lens unit and said second lens unit, said third lens unit moves toward the object side in such a way as to increase a separation between said second lens unit and said third lens unit, and said fourth lens unit moves toward the object side in such a way as to decrease a separation between said third lens unit and said fourth lens unit.

48. A zoom lens according to claim 45, wherein said first lens unit comprises, in order from the object side to the image side, a negative lens of meniscus form having a convex surface facing the object side, a negative lens, and a positive lens of meniscus form having a convex surface facing the object side.

49. A zoom lens according to claim 45, wherein a stop is disposed adjacent to said third lens unit, said stop moving in unison with said third lens unit.

50. A zoom lens according to claim 49, wherein said stop is disposed on the object side of said third lens unit.

51. A zoom lens according to claim 45, wherein said second lens unit and said fourth lens unit move in unison with each other during variation of magnification.

52. A zoom lens according to claim 45, wherein said third lens unit comprises one positive lens and one negative lens, and the following condition is further satisfied:

$$1.5 < |f3/fw| < 3.0$$

where f3 is a focal length of said third lens unit.

53. A zoom lens according to claim 45, wherein said zoom lens consists of said first to fourth lens units, said fourth lens unit comprises one positive lens and one negative lens, and the following condition is further satisfied:

$$2.5 < |f4/fw| < 8.0$$

where f4 is a focal length of said fourth lens unit.

54. A zoom lens according to claim 45, wherein said second lens unit has a cemented lens composed of a negative lens and a positive lens, and the following condition is further satisfied:

$$20 < \nu 2p - \nu 2n$$

where $\nu 2p$ is an Abbe number of a material of said positive lens of said cemented lens of said second lens unit, and $\nu 2n$ is an Abbe number of a material of said negative lens of said cemented lens of said second lens

unit.

55. A zoom lens according to claim 45, wherein said third lens unit has a cemented lens composed of a negative lens and a positive lens, and the following conditions are further satisfied:

$$4.0 < \nu 3n - \nu 3p < 12.0$$

$$0.05 < N3p - N3n < 0.20$$

where $\nu 3n$ is an Abbe number of a material of said negative lens of said cemented lens of said third lens unit, $\nu 3p$ is an Abbe number of a material of said positive lens of said cemented lens of said third lens unit, N3p is a refractive index of the material of said positive lens of said cemented lens of said third lens unit, and N3n is a refractive index of the material of said negative lens of said cemented lens of said third lens unit.

56. A zoom lens according to claim 45, wherein said fourth lens unit has at least one aspheric surface.

57. A zoom lens according to claim 45, wherein said fourth lens unit has a plastic aspheric lens.

58. An image pickup apparatus comprising a zoom lens according to claim 45, a photosensitive member, and means for supporting said zoom lens and said photosensitive member.

59. An image projection apparatus comprising a zoom lens according to claim 45, a light source, and an image forming element, and arranged to project an image.

60. A zoom lens according to claim 1 or 18, wherein the following conditions are satisfied:

$$1.1 < |f1/fw| < 1.4$$

$$0.8 < |f2/fw| < 1.1$$

where f1 and f2 are focal lengths of said first lens unit and said second lens unit, respectively, and fw is a focal length of said zoom lens in a wide-angle end.